What is claimed is:

1. An apparatus comprising:

a substrate;

a waveguide mounted on the substrate; and

an optoelectronic chip bonded to the substrate and having an optical element directly engaging the waveguide.

2. An apparatus as defined in claim 1, wherein the optoelectronic chip is a flip-chip.

3. An apparatus as defined in claim 1, wherein the optical element comprises a transceiver, a receiver or a transmitter.

4. An apparatus as defined in claim 1, wherein the optoelectronic chip is bonded to the substrate via an electrical connection between facing surfaces of the optoelectronic chip and the substrate.

5. An apparatus as defined in claim 1, further comprising an underfill material disposed between the optoelectronic chip and the substrate.

6. An apparatus as defined in claim 1, wherein the underfill is not disposed between the optical element and the waveguide.

7. An apparatus as defined in claim 1, wherein the waveguide includes a mirror.

8. An apparatus as defined in claim 7, wherein the mirror includes a metallized mirror.

9. An apparatus as defined in claim 1, wherein the waveguide includes a volume diffraction grating.

10. An apparatus as defined in claim 1, wherein the waveguide includes a planar waveguide.

11. An apparatus comprising:

a substrate;

a flip-chip having an optical element;

a waveguide at least partially disposed between the substrate and the flip-chip, the waveguide having a thermal stability sufficient to withstand a flip-chip bonding temperature; and

solder bumps to couple the flip-chip to the substrate such that the optical element engages the waveguide.

12. An apparatus as defined in claim 11, wherein facing surfaces of the flip-chip and the substrate are electrically connected.

13. An apparatus as defined in claim 11, wherein a tension force associated with the solder bumps draws the flip-chip and the substrate together when the solder bumps are soldered.

14. An apparatus as defined in claim 13, wherein the tension force causes the flip-chip to engage the waveguide.

15. An apparatus as defined in claim 13, wherein the tension force causes the optical element to directly engage the waveguide.

16. An apparatus as defined in claim 11, wherein the flip-chip is positioned on the substrate using a thermocompression bonder in a z-axis distance control mode.

17. An apparatus as defined in claim 16, wherein the thermocompression bonder causes the flip-chip to directly engage the waveguide.

18. An apparatus as defined in claim 16, wherein the thermocompression bonder causes the optical element to directly engage the waveguide.

19. An apparatus comprising;

a substrate having a first plurality of solder bumps;

a waveguide mounted to the substrate; and

a flip-chip having an optical element and a second plurality of solder bumps, the first and second plurality of solder bumps having a combined thickness prior to soldering which is greater than a height of the waveguide.

20. An apparatus as defined in claim 19, wherein, after soldering, the combined thickness is approximately equal to the height of the waveguide.

21. An apparatus as defined in claim 19, wherein the waveguide has a glass transition temperature above the melting point of the solder bumps.

22. An apparatus as defined in claim 19, wherein the substrate includes a FCPGA substrate.

23. An apparatus comprising;

a substrate;

a flip-chip coupled to the substrate;

an optically active waveguide mounted to the substrate and directly engaging the flip-chip; and,

a passive waveguide located to maintain a predetermined separation between the flip-chip and the substrate.

24. An apparatus as defined in claim 23, wherein the active waveguide and the passive waveguide are separate waveguides.

25. An apparatus as defined in claim 23, wherein the active waveguide and the passive waveguide are integrally formed.

26. A method of mounting a flip-chip to a substrate comprising:

positioning a waveguide on the substrate;

locating the flip-chip at least partially on the waveguide; and

soldering the flip-chip to the substrate such that a surface tension of a molten solder draws the flip-chip and the waveguide into engagement.

27. A method as defined in claim 26, wherein soldering the flip-chip to the substrate comprises capturing the waveguide between the flip-chip and the substrate.

28. A method as defined in claim 26, wherein soldering the flip-chip to the substrate comprises making an electrical connection between the flip-chip and the substrate.

29. A method as defined in claim 26, wherein soldering the flip-chip to the substrate pulls the optical element of the flip-chip into direct engagement with the waveguide.

30. A method as defined in claim 26, further comprising disposing an underfill material between the flip-chip and the substrate.

31. A method as defined in claim 30, further comprising preventing the underfill material from entering between the optical element and the waveguide.

32. A method as defined in claim 26, further comprising positioning a spacer on the substrate.

33. A method as defined in claim 32, wherein locating the flip-chip at least partially on the waveguide includes locating the flip-chip at least partially on the spacer.

34. A method as defined in claim 32, wherein a thickness of the spacer is substantially equal to the thickness of the waveguide.

35. A method as defined in claim 32, wherein the spacer comprises a second waveguide.

36. A method as defined in claim 26, wherein the waveguide includes a planar waveguide.

37. A method as defined in claim 26, wherein soldering the flip-chip to the substrate comprises tacking the flip-chip to the substrate and maintaining a constant pressure between the flip-chip and the substrate at a temperature below the melting point of the solder.

38. A method of mounting a flip-chip to a substrate comprising:

positioning a waveguide on the substrate;

locating the flip-chip at least partially on the waveguide; and

soldering the flip-chip to the substrate using a thermocompression bonder with z-axis distance control bonding capabilities.

39. A method as defined in claim 38, wherein soldering the flip-chip to the substrate comprises drawing the flip-chip and the waveguide together.

40. A method of manufacturing comprising:

securing a bottom surface of a waveguide to a substrate; and

bonding an optoelectronic chip to the substrate while using the waveguide as a spacer between the optoelectronic chip and the substrate.

41. A method of manufacturing as defined in claim 40, wherein bonding the optoelectronic chip to the waveguide directly engages an optical element of the optoelectronic chip with the waveguide.

42. A method of manufacturing as defined in claim 40, wherein bonding the optoelectronic chip to the waveguide butt-couples an optical element of the optoelectronic chip to the waveguide.

43. A method of manufacturing as defined in claim 40, wherein bonding the optoelectronic chip to the waveguide creates an electrical connection between the optoelectronic chip and the substrate.

44. A method of manufacturing as defined in claim 40, wherein bonding the optoelectronic chip to the substrate comprises tack-and-reflow bonding the optoelectronic chip to the substrate.